

Felt & Acoustics

Open-office spaces are changing the face of the workplace. As office layouts ditch “the dreaded cubicle” in favor of a more collaborative environment, research is discovering new risks to our stress levels, brain function, and overall health. The culprit: noise pollution.

While unwanted sound is considered one of the most common annoyances in the workplace, low-intensity noise - the kind from ringing telephones, humming and buzzing electronics, and the conversations of colleagues - is a subtler stressor. Most people have learned to tune it out, yet it remains a hazard in both the workplace and the classroom. Studies have found links between exposure to subliminal noise and decreased motivation, mood, and overall job satisfaction, as well as interference with memory function and complex, creative thinking.

Wool Felt

As a surface material, wool felt meets both the aesthetic and acoustic demands of a wide variety of spaces. Wool has the inherent capacity to dampen vibration and shield from ambient noise due to its elastic hollow keratin fibers. In turn, the absorption characteristics of wool felt vary based on the density of the fibers: softer or lower-density felt is more sound-absorbent. This makes wool felt versatile enough to incorporate into a wide range of noise-sensitive environments, including:

- Hotels
- Emergency rooms
- Auditoriums
- Screening rooms
- Open-concept offices
- Restaurants
- Recording studios

The Science of Sound Absorption

Sound absorption is often confused with sound *isolation*, but these two qualities represent different goals. Sound absorption reduces the reverberation of sound energy in a room so that people can hear better and thus speak more quietly. Whereas sound isolation blocks out sound from an enclosed space, sound absorption improves a space’s acoustic quality.

Acoustic quality demands a combination of absorption and diffusion. Absorbent materials take in sound energy, which would otherwise bounce off hard, flat surfaces, and convert it into heat energy. Diffusive surfaces, due to their uneven structure, literally scatter the sound energy over a wide area without allowing it to escape the room. This combination of dampening and

dissipation of sound results in eliminated echo, clearer sound, and improved speech intelligibility.

Meeting Acoustic Requirements

The Noise Reduction Coefficient (NRC) is a scalar representation of a surface's capacity to absorb sound energy. An NRC of 0 indicates perfect reflection, while an NRC of 1 indicates perfect absorption.

NRC represents an average noise reduction coefficient. It is calculated based on a three-part formula of assembly, which factors in:

1. Total area of the space
2. How much acoustic treatment is applied
3. Materials used

For comparison, a cube-shaped space with hard, reverberant surfaces and no upholstery, carpet, or soft furnishings would produce more echo and have a low NRC rating. By contrast, a room covered with drywall and floor-to-ceiling soundproofing panels would score on the higher end of the scale.

It is a common misconception that NRC refers to the sound absorbency of wool felt alone. In most cases, a material by itself cannot meet the NRC requirements for a space. Instead, core materials such as wool and cotton are assembled with a frame or backing made of wood or other hard material. Interior Felt's clients are given a range of core materials to choose from, including the most environmentally-sustainable options. With the right core and backing materials, Interior Felt can achieve a solution of up to 1.0 NRC.

Core Materials and Their NRC Rankings

Among core materials, the more microscopically fibrous substances will absorb more sound energy. Hence, cotton and fiberglass have the highest ratings for noise reduction. Although wool fiber is a fairly new material in terms of acoustic research and lacks robust data around its NRC, it is widely regarded as on par with cotton.

How much sound absorption wool felt will achieve depends upon its density. Harder, or denser, felt tends to reflect sound energy, while felt with looser fibers are more absorbent. Different densities can be layered with hard felt to meet acoustic requirements. A major advantage of wool felt as a core material is that it can be customized to absorb a specific sound frequency based on density alone.

At Interior Felt, clients have a selection of core materials to suit their requirements (see Table 1).

Table 1: Interior Felt Core Materials and their Density Ranges

Core Material	Density Range (pounds per cubic foot)
Wool	1.5-2.5 (based on rigidity and density)
Recycled Cotton Fiber	3-6
Polyester (PET)	1.5-9.5
VOC Free Fiberglass	3-6.5

In today's changing workplace, noise-reduction solutions must provide a sense of privacy and quiet while maintaining the openness of the environment. With its inherent acoustic properties, as well as fire-retardancy, environmental sustainability, and natural beauty, wool felt is an ideal interior design material. Interior Felt works with clients to create a customized solution that meets NRC requirements, using high quality wool felt as well as cotton, polyester, and fiberglass.